(c) A tension member carries a factored axial tension of 450 kN. Design section and its connection with a gusset plate and lug angle. Take f_y = 250 N/mm² and f_u = 410 N/mm².

4. Attempt any **one** part of the following : **(20×1=20)**

(a) Design a built up column with two channels placed face – to – face. The column is of 6.6 m effective length and supports a factored load 1500 kN. Also design the lacing system.

(b) (i) Design a double angle discontinuous strut to carry a load of 250 kN. The length of the strut between c/c of intersections is 3.85 m.

(ii) Design a column section to be used in a public building. Column is 4.80 m long with both of its ends restrained in direction and position in *zz* as well as *yy* directions. The column is to support a factored load of 2500 kN.

5. Attempt any **one** part of the following : **(20×1=20)**

(a) A simply supported steel joist of 4.0 m effective span is laterally unsupported throughout. It carries a total uniformly distributed load of 40 kN (inclusive of self-weight). Design an appropriate section using steel of grade Fe 410.

(b) Design a laterally supported beam for the following data :

Effective span	=	4 m
Maximum bending moment	=	550 kN – m
Maximum shear force	=	200 kN
Steel of grade	=	Fe 410

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(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2693 Roll No. | | | | | | | | | | |

B.Tech.

(SEM. VII) ODD SEMESTER THEORY EXAMINATION 2013-14

DESIGN OF STEEL STRUCTURES

Time : 3 Hours *Total Marks : 100*

Note :– Attempt **all** questions. All questions carry equal marks. Use Limit State Design method; following the recommendations given in IS : 800 – 2007. Use of this code is permitted. Draw neat sketches. Assume any missing data suitably if required.

1. Attempt any **four** parts of the following : **(5×4=20)**

(a) Write any three advantages and disadvantages of steel used as a structural material.

(b) Give the chemical composition of structural steel and discuss the amount of carbon in it.

(c) Sketch various types of rolled steel sections available in market.

(d) Explain stress – strain curve of mild steel and discuss salient points on it.

(e) What are the partial safety factors for materials adopted by IS : 800 – 2007 code ?

(f) List various loads which are considered in design and discuss any one.

2. Attempt any **two** parts of the following : **(10×2=20)**

(a) Determine the strength and efficiency of the lap joint shown in Fig. 2a. The bolts are of 20 mm diameter and of grade 4.6. The two plates to be jointed are 10 mm and 12 mm thick. Use steel of grade Fe 410.

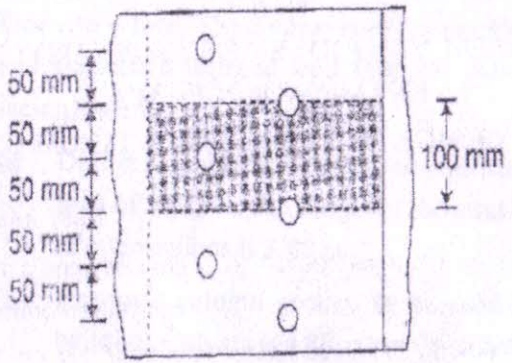


Fig. 2a

(b) Design a joint B of a roof truss as shown in Fig. 2b. The members are connected with 16 mm diameter bolts of grade 4.6 to the gusset plate 12 mm thick.

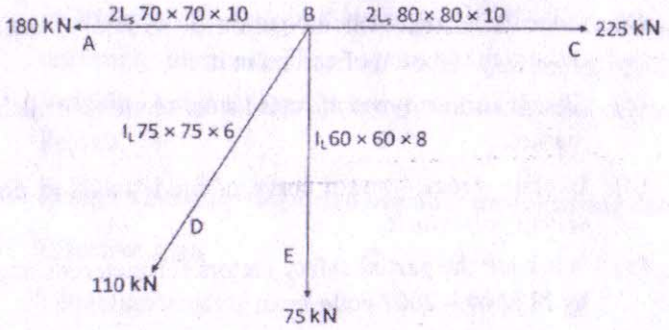


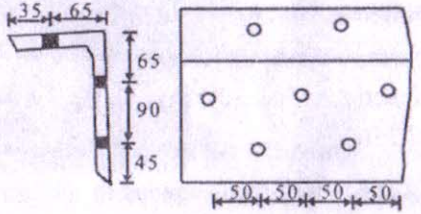
Fig. 2b

(c) An ISLC 300 @ 324.7 N/m (Fe 410 grade of steel) is to carry a factored tensile force of 900 kN. The channel section is to be welded at the site to a gusset plate 12 mm thick. Design a fillet weld, if the oyerlap is limited to 350 mm.

3. Attempt any **two** parts of the following : **(10×2=20)**

(a) (i) Determine the effective net area of ISA 200 × 100 × 12 members shown in the following Fig. 3a.

(ii) Determine the block shear strength of the welded tension member shown in Fig. 3b. Use steel of grade Fe 410.



18 mm diameter bolt holes

Fig. 3a

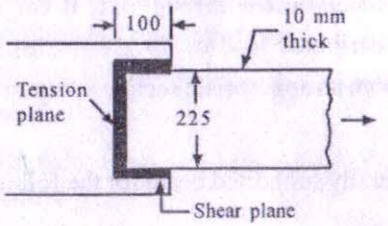


Fig. 3b

(b) Select a suitable angle section to carry a factored tensile force of 290 kN. Assuming a single row of M 24 bolts and design strength f_y = 250 N/mm².